UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/591,894	05/01/2007	Byung-Cheol Lee	1455-062610	7985

28289 7590 05/05/2009

THE WEBB LAW FIRM, P.C.
700 KOPPERS BUILDING
436 SEVENTH AVENUE
PITTSBURGH, PA 15219

EXAMINER	
HULL, SHERYL L	

ART UNIT	PAPER NUMBER
4148	

MAIL DATE	DELIVERY MODE
05/05/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/591,894	LEE ET AL.	
	Examiner	Art Unit	
	SHERYL HULL	4148	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-15* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,8-13 and 15* is/are rejected.

7)☒ Claim(s) *5-7 and 14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09/07/2006* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/10/2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character not mentioned in the description: 322. Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. The disclosure is objected to because of the following informalities: paragraph [2] discloses “sufficiently" and paragraph [56] discloses “firs”, which appear to be typographical errors.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claim 1, 3, 4, 8-11, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dally et al. (US 2005/0225224) in view of Bayless (US 4,008,413; Bayless'413), and further in view of Bayless (US 3,978,363; Bayless'363).

5. Regarding claim 1 and referring to Figure 1, Dally et al., discloses an electron beam irradiator (10, equivalent to electron flux generator) comprising:

a vacuum chamber (17 is the vacuum region) having a beam irradiation window formed longitudinally in an outer periphery of the vacuum chamber (12);

a cathode (11) placed centrally and longitudinally inside the vacuum chamber, and having a field emitter tip (18) formed on the cathode (11), corresponding to the beam irradiation window (12); a high voltage supply placed at one end of the vacuum chamber (14), and adapted to apply high voltage toward the cathode.

Dally et al., shows a first support including a pin insert hole formed at one end of the cathode (11), but does not teach a first insulator formed in the high voltage supply for the passage of a high voltage supply pin so that the high voltage supply pin is inserted into the pin insert hold of the cathode through the first insulator;

or a second support including an insert groove formed in a second insulator longitudinally and axially located at the other end of the cathode so that an insert protrusion formed at the other end of the cathode is inserted into the insert groove to support the cathode.

In Figure 2, Bayless'413 discloses a first insulator (74) formed in the high voltage supply for the passage of a high voltage supply pin (77) so that the high voltage supply pin is inserted into the pin insert hole of the cathode through the first insulator (74);

In Figure 2, Bayless'363 discloses a second support (20) including an insert groove (26, equivalent to bore) formed in a second insulator longitudinally and axially located at the other end of the cathode so that an insert protrusion (22) formed at the other end of the cathode (shown as 12 on Figure 1) is inserted into the insert groove (26) to support the cathode. In the abstract, Bayless'363 discloses that the support (20) is ceramic, which is an insulator.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the electron beam irradiator disclosed by Dally et al., with the high voltage cathode support structure disclosed by Bayless 413 and the second cathode support structure disclosed by Bayless'363. The motivation would have been to minimize the possibility of Paschen, vacuum, surface and bulk breakdown (Bayless'413, column 1, lines 15-16) and further to provide a mechanical support for the cathode which is capable of withstanding a high electric field and avoiding vacuum breakdown (Bayless'363, column 1, lines 51-55). Therefore, it would have been obvious to combine Dally et al., with Bayless'413 and Bayless'363 in order to achieve the invention as described in claim 1.

6. Regarding claim 3, Dally et al., in view of Bayless'413, and further in view of Bayless'363, teaches all of the elements of parent claim 1 as recited above. Dally et al., further discloses that the cathode (11) is of a rod-shaped structure having a circular

cross-section. Dally et al., teaches that the emitters (18) are aligned with the window slots (12) (paragraph [0013]) and that the window slots (12) can be multiple longitudinal or radial openings relative to the surface of the cylinder (paragraph [0024]). Therefore, it is obvious that one of ordinary skill in the art could form a field emitter tip shaped as a strip formed longitudinally in an outer periphery of the rod-shaped structure. The motivation would be to minimize electron interception on the metal shell while optimizing production methods and cost (paragraph [0020]).

7. Regarding claim 4, Dally et al., in view of Bayless'413, and further in view of Bayless'363, teaches all of the elements of parent claim 3 as recited above. Dally et al., further discloses in Figure 1 that the field emitter tip (18) is formed along the circular cross-section of the cathode (11) to radially emit electron beams.

8. Regarding claim 8, Dally et al., in view of Bayless'413, and further in view of Bayless'363, teaches all of the elements of parent claim 1 as recited above. Dally et al., further discloses in Figure 1, that the vacuum chamber is cylindrical (paragraph [0011]), with a plurality of beam irradiation windows (12) formed in an outer periphery thereof, and wherein the cathode (11) placed inside the vacuum chamber has field emitter tips (18) formed in an outer periphery of the cathode (11), corresponding to the beam irradiation windows (12) of the vacuum chamber, respectively.

9. Regarding claims 9, 10 and 11, Dally et al., in view of Bayless'413, and further in view of Bayless'363, teaches all of the elements of parent claim 8 as recited above. Dally et al., further discloses in Figure 4 and paragraph [0004] that the electron beam windows (12) may be formed at multiple sides of the vacuum chamber. Dally et al.,

further discloses that the surface of an object can be moved beneath a stationary electron beam irradiator or the emitter may be moved along the path of a stationary or curved surface to provide treatment (paragraph [0029]).

10. Regarding claim 15, Dally et al., in view of Bayless'413, and further in view of Bayless'363, teaches all of the elements of parent claim 3 as recited above. Dally et al., further discloses in Figure 1 that the vacuum chamber is cylindrical, with a plurality of beam irradiation windows (12) formed in an outer periphery thereof, and wherein the cathode (11) placed inside the vacuum chamber has field emitter tips (18) formed in an outer periphery of the cathode (11), corresponding to the beam irradiation windows (12) of the vacuum chamber, respectively.

11. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dally et al., in view of Bayless'413, further in view of Bayless'363, and further in view of Gao et al. (US 2004/0256975).

Dally et al., in view of Bayless'413, further in view of Bayless'363, teaches all of the elements of parent claim 1 as recited above, but does not teach that the field emitter tip is made of a carbon nanotube.

In Figure 1, Gao et al., discloses a cathode (100) on which a field emission layer (104) is formed and teaches that the field emission layer is preferably comprised of carbon nanotubes (paragraphs [0039] and [0040]).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the electron beam irradiator disclosed by Dally et al., in view of Bayless'413, and further in view of Bayless'363, with the field emission layer made of

carbon nanotubes as disclosed by Gao et al. The motivation would have been to provide an enhanced bonding structure between the field emission layer and the cathode material (paragraph [0020]). Therefore, it would have been obvious to combine Dally et al., with Bayless'413, Bayless'363 and Gao et al., in order to achieve the invention as described in claim 2.

12. Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fink et al. (US 7,078,716), in view of Bayless'413, and further in view of Bayless'363.

13. Regarding claim 12 and referring to Figure 4, Fink et al., discloses an electron beam irradiator comprising:

a vacuum chamber (406) having a plurality of beam irradiation windows formed longitudinally in an outer peripheral area of the vacuum chamber (402);

a cathode placed inside the vacuum chamber, and having at least one linear area formed thereon and a plurality of field emitter tips formed on the linear area, corresponding to the beam irradiation windows, respectively (401).

Fink et al., does not disclose a high voltage supply placed at one end of the vacuum chamber, and adapted to apply high voltage toward the cathode; a first support including a pin insert hole formed at one end of the cathode and a first insulator formed in the high voltage supply for the passage of a high voltage supply pin so that the high voltage supply pin is inserted into the pin insert hole of the cathode through the first insulator; and a second support including an insert groove formed in a second insulator longitudinally and axially located at the other end of the cathode so that an insert

protrusion formed at the other end of the cathode is inserted into the insert groove to support the cathode.

Bayless'413 and Bayless'363, disclose all of the elements of the high voltage supply and the second cathode support as recited for claim 1 above, but do not explicitly disclose that a pin insert hole is formed at one end of the cathode. This is implied in Bayless' 413 in column 3, lines 1-4, where it is disclosed that the conductor (77) supplies high voltage to a cathode.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to combine the electron beam irradiator disclosed by Fink et al., with the high voltage cathode support structure disclosed by Bayless'413 and the second cathode support structure disclosed by Bayless'363. The motivation would have been to minimize the possibility of Paschen, vacuum, surface and bulk breakdown (Bayless'413, column 1, lines 15-16) and further to provide a mechanical support for the cathode which is capable of withstanding a high electric field and avoiding vacuum breakdown (Bayless'363, column 1, lines 51-55). Therefore, it would have been obvious to combine Fink et al., with Bayless'413 and Bayless'363 in order to achieve the invention as described in claim 12.

14. Regarding claim 13, Fink et al., in view of Bayless'413, and further in view of Bayless'363, discloses all of the elements of claim 11 as recited above. In Figure 4, Fink et al., further discloses that the vacuum chamber (406) has at least one linear area opposed in parallel to the linear area of the cathode (401), in which the beam irradiation windows (402) are formed.

Allowable Subject Matter

15. Claims 5, 6, 7 and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

16. Claim 5 recites, "The electron beam irradiator according to claim 1, further comprising: fixing flanges integrally provided at both ends of the vacuum chamber; a first vacuum flange coupled with one of the fixing flanges, and having a high voltage supply; and a second vacuum flange coupled with the other one of the fixing flanges."

17. Claim 7 recites, *inter alia*, "a metal wire inserted into a insert groove formed in an outer periphery of the slit of the base plate; a metal foil placed on the metal wire, and having an area slightly larger than an area surrounded by the metal wire."

18. Claim 14 recites, "The electron beam irradiator according to claim 3, further comprising: fixing flanges integrally provided at both ends of the vacuum chamber; a first vacuum flange coupled with one of the fixing flanges, and having a high voltage supply; and a second vacuum flange coupled with the other one of the fixing flanges."

The references of record do not teach or suggest the aforementioned limitations, nor would it be obvious to modify those references in order to include such limitations.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SHERYL HULL whose telephone number is (571)270-

3347. The examiner can normally be reached on Monday through Thursday from 0700 to 1630 and every other Friday from 0700 to 1530.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anh Mai can be reached on 571-272-1995. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Anh T. Mai/
Supervisory Patent Examiner,
Art Unit 4148

/S. H./
Examiner, Art Unit 4148
April 30, 2009